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Nowhere To Hide

New Smart Munitions Rain Certain Destruction From The Sky

A well publicized General Accounting Office (GAO) report released in June asserted that many Defense Department and military service claims about weapon system performance during the Gulf War's air campaign were overstated. For example, the GAO found that the "one target, one bomb" capability attributed to laser-guided bombs, the "smart" weapon of choice that looked so impressive on American television screens, was not supported by the facts. The GAO also found that "airpower was inhibited by the limited ability of aircraft sensors to identify and acquire targets" due to clouds, haze, dust, and smoke.

A new generation of air-delivered smart munitions is now entering the services' inventories that promises to make true believers out of even the most skeptical GAO investigators. These new aircraft- and artillery-delivered weapons have overcome the deficiencies of earlier-generation smart bombs by using small terminally guided submunitions that can find and destroy priority targets on the ground autonomously, day or night and in adverse weather. Three new smart munitions, in particular - the Sensor Fuzed Weapon, SADARM, and BAT - have compiled a string of highlyÊsuccessful live firings over the past few years after each encountered technical problems earlier in their development.

MULTIPLE TANK KILLER

The Air Force's Sensor Fuzed Weapon (SFW), designated the CBU-97, is the world's first operational air-delivered cluster bomb with terminally guided submunitions. Developed by Textron Systems, it entered low-rate initial production (LRIP) in 1992 and full-rate production in 1996 following an unprecedented success rate in more than 100 tests (November AFJI). Last February, Air Combat Command declared an initial operational capability on F-16 fighters.

Originally developed for low-altitude, high-speed delivery, SFW consists of 10 BLU-108 submunitions that are released from an air-dropped, cylindrical tactical munitions dispenser. Each submunition carries 4 Skeet antiarmor warheads, for a total of 40 Skeets per SFW. Each 5-inch diameter Skeet independently scans the ground as it descends using an infrared (IR) sensor. When it detects a heat source such as a tank engine, the Skeet fires an explosively formed penetrator (EFP) slug downward through the top of the target vehicle.

Each Skeet scans 2/3 of an acre; the 40 Skeets in each CBU-97 search a total of about 15 acres. SFW provides multiple armored kills per aircraft pass, which will reduce the number of aircraft sorties and weapons required to kill a target array.

Qualified initially on the F-16 fighter, SFW is also considered operational on the B-1 bomber following a May test. A B-1 flew 1,300 miles nonstop from Ellsworth AFB, SD to Eglin AFB, FL, dropped a single SFW at low altitude, and returned to Ellsworth. The weapon achieved 13 hits on 4 targets in an armored vehicle array. The B-1 can carry 30 CBU-97s, compared to four on the F-16.

In another flight test early this year, an SFW was "cold-soaked" to a temperature of -65 degrees Celsius for 12 hours. Then, after being carried at high altitude on a B-52 bomber's wing station, the single weapon was dropped from an F-16 at 500 feet, scoring seven hits on five targets.

The Air Force awarded Textron an SFW preplanned product improvement (P3I) contract last year. The P3I version of the CBU-97, slated to enter production in 1999, will search twice as much area on the ground - 30 acres - thanks to upgrades to the Skeet. These include adding an active IR sensor that will complement the passive IR sensor to improve target detection and false target rejection.

Jeffrey Picard, Textron's SFW Product Team Leader, told AFJI that the active sensor uses a laser-emitting diode, which transmits a beam in the IR band. It reflects off the ground, allowing the sensor to measure range to a target and changes in target height or profile that help characterize the target. Picard said the active sensor makes it possible to increase the altitude at which the sensors begin operating while retaining target discrimination, doubling each Skeet's search area on the ground.

An outer ring of 16 pellets will also be added around the Skeet's copper liner EFP to increase the warhead's destructive area and make it effective against softer targets, such as air defense equipment, in addition to heavy armor.

The SFW is truly all-weather. Picard told AFJI that clouds, fog, rain, and snow do not interfere with its performance and said the passive IR sensor has also been very effective in countermeasures tests against smoke. He added that the performance of the planned active sensor is only degraded by very dense smoke and fog and, if that occurred, the passive IR sensor could still detect a target.

EXPANDING SFW'S UTILITY

SFW currently requires direct overflight delivery by fighter aircraft; however, it will gain standoff range as a result of two other development programs. USAF's Wind Corrected Munitions Dispenser (WCMD) will be adapted to SFW to allow accurate, medium- to high-altitude delivery, and a variant of the new Navy-USAF Joint Standoff Weapon (JSOW) will carry BLU-108 submunitions.

WCMD, in pilot production by Lockheed Martin-Orlando, is a tail kit with an inertial guidance unit, wind estimation and compensation software, and moveable tail fins that will replace the stationary tail on the current SFW tactical munitions dispenser. It will steer the TMD to within 85 feet (26 meters) of its planned dispense point, and will allow SFW to be delivered from altitudes up to 45,000 feet and in adverse weather. In addition to vertical standoff, WCMD will provide the delivery aircraft some horizontal standoff range, e.g., 9-10 miles from 40,000 feet.

The Air Force plans to fit nearly all its SFWs with WCMD tails, beginning in 2000. The SFW/WCMD combination, designated the CBU-105, will be a particularly important conventional payload for USAF's B-52, B-1, and B-2 bombers.

The AGM-154B version of Raytheon TI Systems' JSOW (June AFJI), an unpowered glide vehicle, will dispense six BLU-108 submunitions with a total of 24 Skeets. It will be launched from USAF and Navy fighters and bombers from ranges up to 40 nautical miles from a target. (The initial AGM-154A variant of JSOW, which dispenses 145 combined effects bomblets, entered low-rate production last February.) The AGM-154B will carry the P3I version of the BLU-108; the 24 improved Skeets will search an area of 26 acres.

USAF Col. William Wise, Program Director, Area Attack Weapons at Eglin AFB, FL, told AFJI in

early September that three of nine planned AGM-154B test launches with inert submunitions had been completed, all from the F-16. He noted: "Our post-flight analysis indicates that all three JSOWs would have met or exceeded our kills-per-weapon requirement if they had been configured with live BLU-108 submunitions and delivered against actual targets. One test experienced an anomaly during the dispense phase of the flight. This is currently under investigation and has slowed the development flight test program." The latter will conclude with two firings from an F-16 with a full load of live BLU-108s in early 1998, he said. An LRIP decision is planned in December 1998. The Air Force currently expects to buy 3,000 AGM-154B JSOWs and the Navy 1,200.

ARMY SMART MUNITIONS

The US Army's Sense and Destroy Armor (SADARM), a projectile fired from 155mm howitzers, is the world's first artillery-delivered smart munition to enter production. The antiarmor weapon was primarily designed for use in a counterbattery role against enemy self-propelled artillery and rocket launchers but is also effective against tanks and infantry fighting vehicles. SADARM will allow Army gun crews to silence enemy artillery with fewer rounds, reducing their exposure to hostile fire.

Each 155mm SADARM projectile, a "wooden round" that requires no special handling or training to fire, contains two 5.8-inch-diameter submunitions, which are ejected at an altitude of 1,000 meters. Each submunition carries a combination of active and passive millimeter-wave radar- and imaging IR sensors that search an area about 150 meters in diameter (four football fields joined together) as the submunition descends by parachute. A sophisticated computer software algorithm correlates data from the sensors simultaneously. This offsets battlefield conditions, adverse weather, and countermeasures that hinder the effectiveness of one type of sensor and allows high-confidence detection of a valid target based on its unique size, shape, and IR signature. Like SFW, the SADARM submunition fires an EFP slug downward at the top of the target vehicle.

Developed by GenCorp Aerojet and key subcontractor Alliant Techsystems, SADARM entered LRIP in April 1995. It has achieved impressive test results since overcoming technical problems encountered in 1993 firings that nearly led to the program's demise.

In an April 1994 live-fire test, 13 SADARM projectiles (26 submunitions) scored 11 vehicle hits against a stationary target array. SADARM closed out its engineering and manufacturing development (EMD) phase with a May 1996 test in which an M109A6 Paladin, the latest version of the Army's self-propelled 155mm howitzer, hit 8 targets with 9 projectiles fired at a range of 22 kilometers. In tests of the first production rounds last December, SADARM hit five armored targets with four projectiles, nearly double its classified success criteria, according to the Army. And in live volley firing last May, six guns each fired a SADARM projectile simultaneously against a target array, achieving six target hits.

In a 20 August interview, Col. James E. Unterseher, the Army's SADARM Project Manager at Picatinny Arsenal, NJ, sounded particularly pleased with initial production tests completed six days earlier at Ft. Greely, AK. They were the first test firings conducted by active-duty soldiers (from the 25th Infantry Division), and the first conducted outside the desert environment at Yuma Proving Grounds, AZ. Weather conditions during five days of shooting included fog, rain, and high winds.

While he couldn't give specific hit results because the tests involved the use of potential enemy countermeasures (such as smoke), Unterseher termed the firings "very successful," with SADARM achieving its success criteria using less than the number of rounds allocated. He noted that the test environment's terrain and weather were typically European, and proved that the submunition's

sensors work well in non-desert conditions and are truly all-weather "It was a typical operational environment," Unterseher said. He said additional live firings will be conducted in Alaska in snow and cold temperatures this month and next.

The Army accepted the first SADARM production rounds last November and awarded Aerojet a second low-rate initial production contract for 600 projectiles last February. Following operational tests at Ft. Greely next July, SADARM is slated for Army full-rate production approval two months later and will achieve its First Unit Equipped milestone in November 1998.

The Army awarded Aerojet a SADARM product improvement contract last February. Unterseher said Aerojet will upgrade the submunition's electronics and expects to increase its search footprint by a factor of three while reducing the projectile's cost about 10 percent. Aerojet will also develop a combined-effects warhead similar to the P3I SFW warhead that, in addition to the EFP, produces a large shotgun pattern effective against softer targets, such as towed artillery and command and control vehicles, giving SADARM the flexibility to be used against a wider target set.

Unterseher said a cutback in the Army's planned buy of SADARM projectiles (which cost about $30,000 each) from 73,000 to 50,000 relates directly to the greater lethality expected from the improved SADARM, which will be incorporated in the production line in 2001.

Unterseher told AFJI, "I have a very high level of confidence in SADARM's operational capability. The results from the Alaska tests were, in every case, better than our expectations, better than analyses said we'd get."

ACOUSTIC TANK KILLER

Not far behind SADARM is the Army's second and more technically complex smart submunition, the missile-delivered BAT (Brilliant Antiarmor). Developed by Northrop Grumman, BAT is an unpowered, three-foot-long glider 5.5 inches in diameter. It will be dispensed deep behind enemy lines day or night and in adverse weather from the planned Block II and IIA versions of Lockheed Martin Vought Systems' existing Army Tactical Missile System (ATACMS), which currently delivers unguided area bomblets.

Each BAT uses acoustic sensors to detect moving tanks from miles away and an IR seeker for terminal homing. After selecting an individual target in a column of armored vehicles (November AFJI), BAT flies into the top of it, detonating a two-stage shaped-charge warhead. The Block II ATACMS will carry 13 BAT submunitions to a range in excess of 140 km; the Block IIA version will carry six improved BATs, being developed under a P3I program, to a range of more than 300 km.

A Cessna aircraft-released BAT scored a direct hit on a tank or armored personnel carrier in a moving column of vehicles in four separate tests last year and on 14 May of this year. The first flight test of a Block II missile dispensing 13 BAT "simulants" (with flight data recorders and cameras) was scheduled to occur last month; the next test using one real BAT submunition and 12 simulants was planned 4-6 weeks later.

BAT was slated for LRIP approval after the completion of EMD flight tests this December. However, that schedule is expected to slip at least a few months due to a $40-million cut to the Army's $85.2-million SADARM budget request in both the House and Senate versions of the FY98 DoD appropriations bill. A knowledgeable source told AFJI that appropriations committee members acted to slow initial BAT production to give the system time to mature further in testing.

The P3I BAT, which will enter EMD in late 1998 and LRIP in 2001, will feature an improved warhead and a new dual-mode, MMW radar/imaging IR seeker to replace BAT's current Raytheon IR seeker. The new seeker is being competitively developed by Northrop Grumman (formerly Westinghouse) and Alliant Techsystems. It will expand BAT's target list to include missile and rocket launchers and cold stationary targets, such as tanks with their engines turned off.

Don Barker, the Army's ATACMS/BAT deputy project manager in Huntsville, AL, told AFJI that "a couple" BAT flight tests during the past year experienced anomalies, but said the problems were later corrected. He noted, "We're feeling quite confident, from a technical standpoint, that the system works. I don't think there's any doubt in anyone's mind here." Barker said the Block II missile will enter low-rate production in 1999 and is scheduled to become operational with BAT in 2001.

THE NEW GENERATION

SFW, SADARM, and BAT are considered so effective that they are each being evaluated byÊthe Navy as potential payloads for missiles such as Tomahawk, SLAM, and land-attack Standard. They promise to substantially increase the lethality of USAF aircraft and Army artillery and deep-strike missiles, getting more "bang for the buck" out of existing weapons systems in a time of reduced manpower and equipment levels.

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